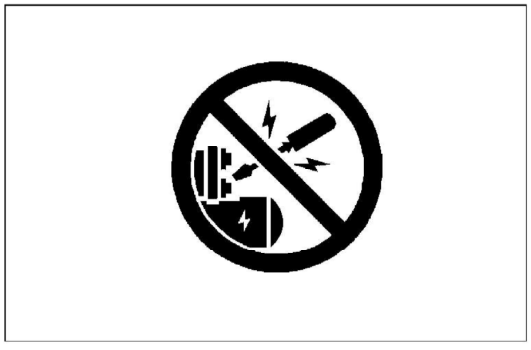
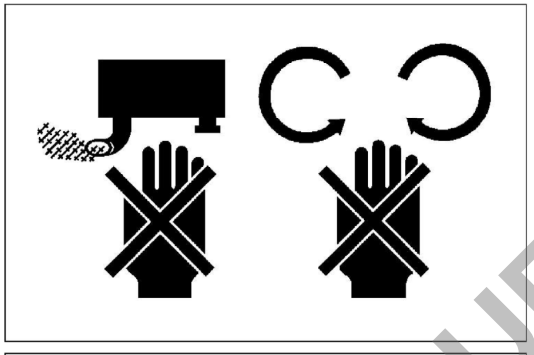


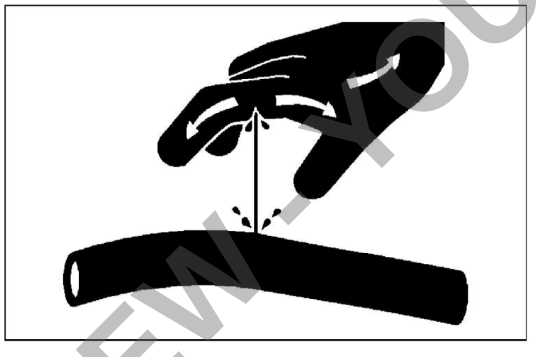
SAFETY STARTING

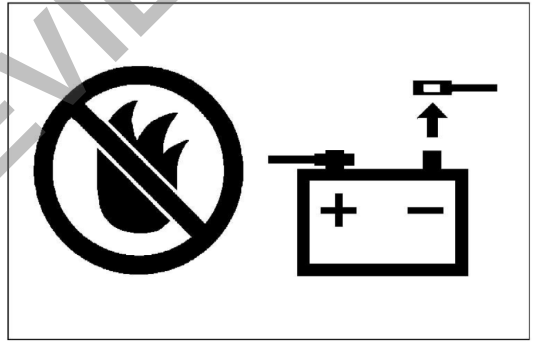
- Do not start the engine by shorting across starter terminals or bypassing the safety start switch.
- Unauthorized modifications to the engine may impair the function and / or safety and affect engine life.



SAFETY WORKING

- Do not work on the machine while under the influence of alcohol, medication, or other substances or while fatigued.
- Wear close fitting clothing and safety equipment appropriate to the job.
- Use tools appropriate to the work. Makeshift tools, parts, and procedures are not recommended.
- When servicing is performed together by two or more persons, take care to perform all work safely.
- Do not touch the rotating or hot parts while the engine is running.
- Never remove the radiator cap while the engine is running, or immediately after stopping. Otherwise, hot water will spout out from radiator. Only remove radiator cap when cool enough to touch with bare hands. Slowly loosen the cap to first stop to relieve pressure before removing completely.
- Escaping fluid (fuel or hydraulic oil) under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic or fuel lines. Tighten all connections before applying pressure.
- Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.





AVOID FIRES

- Fuel is extremely flammable and explosive under certain conditions. Do not smoke or allow flames or sparks in your working area.
- To avoid sparks from an accidental short circuit, always disconnect the battery negative cable first and connect it last.
- Battery gas can explode. Keep sparks and open flame away from the top of battery, especially when charging the battery.
- Make sure that no fuel has been spilled on the engine.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

SPECIFICATIONS

Model		Z442-B (E)	Z482-B (E)	D662-B (E)	D722-B (E)
Type		Vertical, liquid cooled, 4-cycle diesel engine			
Number of Cylinders		2	2	3	3
Bore x Stroke	mm (in.)	64 x 68 (2.52 x 2.68)	67 x 68 (2.64 x 2.68)	64 x 68 (2.52 x 2.68)	67 x 68 (2.64 x 2.68)
Total Displacement	CC (cu. in.)	437 (26.70)	479 (29.23)	656 (40.05)	719 (43.89)
Brake Horse Power	SAE Net Cont. H.P. kW/ min^{-1} (rpm) (HP/ min^{-1} (rpm))	7.5 / 3600 (10.0 / 3600)	8.1 / 3600 (10.8 / 3600)	11.2 / 3600 (15.0 / 3600)	12.2 / 3600 (16.3 / 3600)
	SAE Net Intermittent H.P. kW/ min^{-1} (rpm) (HP/ min^{-1} (rpm))	8.6 / 3600 (11.5 / 3600)	9.3 / 3600 (12.5 / 3600)	12.9 / 3600 (17.3 / 3600)	14.0 / 3600 (18.8 / 3600)
	SAE Gross Intermittent H.P. kW/ min^{-1} (rpm) (HP/ min^{-1} (rpm))	9.5 / 3600 (12.7 / 3600)	10.4 / 3600 (13.9 / 3600)	14.3 / 3600 (19.2 / 3600)	15.6 / 3600 (20.9 / 3600)
	DIN 6271-NA kW/ min^{-1} (rpm) (ps/ min^{-1} (rpm))	7.4 / 3600 (10.0 / 3600)	7.9 / 3600 (10.8 / 3600)	11.0 / 3600 (15.0 / 3600)	12.1 / 3600 (16.4 / 3600)
	DIN 6271-NB kW/ min^{-1} (rpm) (ps/ min^{-1} (rpm))	8.2 / 3600 (11.1 / 3600)	8.9 / 3600 (12.1 / 3600)	12.3 / 3600 (16.7 / 3600)	13.3 / 3600 (18.1 / 3600)
	DIN 70020 kW/ min^{-1} (rpm) (ps/ min^{-1} (rpm))	8.9 / 3600 (12.1 / 3600)	9.7 / 3600 (13.2 / 3600)	13.5 / 3600 (18.3 / 3600)	14.6 / 3600 (19.9 / 3600)
Maximum Bare Speed		3800 min^{-1} (rpm)			
Minimum Bare Idling Speed		900 to 1000 min^{-1} (rpm)			
Combustion Chamber		Spherical type			
Fuel Injection Pump		Bosch MD mini Pump			
Governor		Centrifugal Ball Mechanical Governor			
Direction of Rotation		Counter-clockwise (viewed from flywheel)			
Injection Nozzle		Bosch Throttle Type			
Injection Timing		0.35 to 0.38 rad (20° to 22°) before T.D.C.			
Injection Order		1 - 2	1 - 2	1 - 2 - 3	1 - 2 - 3
Injection Pressure		13.73 MPa (140 kgf/cm^2, 1991 psi)			
Compression Ratio		23 : 1			
Lubricating System		Forced Lubrication by Pump			
Oil Pressure Indication		Electrical Type Switch			
Lubricating Filter		Fuel Flow Paper Filter (Cartridge Type)			
Cooling System		Pressurized Radiator (not included in the basic model), Forced Circulation with Water Pump			
Starting System		Electric starting with Cell Starter			
		12 V, 0.8 kW			
Starting Support Device		by Glow Plug in Combustion Chamber			
Battery		12 V, 35 AH, equivalent			
Generator for Charging		12 V, 150 W			
Fuel		Diesel Fuel No. 2-D (ASTM D975)			
Lubricating Oil		Class CF lubricating oil as per API classification is recommended. If this class of lubricating oil is not available, preferably use Class CD or CE lubricating oil. For details on recommended lubricating oils, see page S-12, 15.			
Lubricating Oil Capacity		2.1 L (2.2 U.S.qts., Oil pan depth 101 mm)		3.2 L (3.4 U.S.qts., Oil pan depth 101 mm)	
		2.5 L (2.6 U.S.qts., Oil pan depth 121 mm)		3.8 L (4.0 U.S.qts., Oil pan depth 121 mm)	
Weight (Dry)		53.1 kg (117.1 lbs)	53.1 kg (117.1 lbs)	63.7 kg (140.4 lbs)	63.1 kg(139.1 lbs)
Application		General Power Source			

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

[4] TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Start	• No fuel	Replenish fuel	–
	• Air in the fuel system	Bleed air	S-14
	• Water in the fuel system	Replace fuel and repair or replace fuel system	–
	• Fuel pipe clogged	Clean	–
	• Fuel filter clogged	Replace	S-16
	• Excessively high viscosity of fuel or engine oil at low temperature	Use the specified fuel or engine oil	S-15
	• Fuel with low cetane number	Use the specified fuel	–
	• Fuel leak due to loose injection pipe retaining nut	Tighten nut	S-27
	• Incorrect injection timing	Adjust	S-57
	• Fuel cam shaft worn	Replace	–
	• Injection nozzle clogged	Clean	S-56
	• Injection pump defective	Repair or replace	S-57
	• Fuel pump defective	Repair or replace	–
	• Seizure of crankshaft, camshaft, piston or bearing	Repair or replace	–
	• Compression leak from cylinder	Replace head gasket, tighten cylinder head bolt, glow plug and nozzle holder	S-24
	• Improper valve seat alignment, valve spring broken, valve seized	Repair or replace	S-39
	• Improper valve timing	Adjust	S-57
	• Piston ring worn	Replace	S-34
	• Excessive valve clearance	Adjust	S-19
[Starter Does Not Work]	• Battery discharged	Charge	–
	• Starter defective	Repair or replace	S-61
	• Main switch defective	Repair or replace	–
	• Wiring disconnected	Connect	–
Engine Revolution Is Not Smooth	• Fuel filter clogged or dirty	Replace	S-16
	• Air cleaner clogged	Clean or replace	S-15
	• Fuel leak due to loose injection pipe retaining nut	Tighten nut	S-14
	• Injection pump defective	Repair or replace	S-57
	• Incorrect nozzle opening pressure	Adjust	S-56
	• Injection nozzle suck or clogged	Repair or replace	S-56
	• Fuel over flow pipe clogged	Clean	–
	• Governor defective	Repair	–
Either White Or Blue Exhaust Gas Is Observed	• Excessive engine oil	Reduce to the specified level	–
	• Piston ring worn or stuck	Replace	S-34
	• Incorrect injection timing	Adjust	S-57
	• Deficient compression	Check the compression pressure	S-24
Either Black Or Dark Gray Exhaust Gas Is Observed	• Overload	Lessen the load	–
	• Low grade fuel used	Use the specified fuel	–
	• Fuel filter clogged	Replace	S-16
	• Air cleaner clogged	Clean or replace	S-15
Deficient Output	• Incorrect injection timing	Adjust	S-57
	• Engine's moving parts seem to be seizing	Repair or replace	–
	• Uneven fuel injection	Repair or replace the injection pump	–
	• Deficient nozzle injection	Repair or replace the nozzle	S-56
	• Compression leak	Replace head gasket, tighten cylinder head bolt, glow plug and nozzle holder	S-24

KiSC issued 09, 2005 A

PREVIEW YOUFIXTHIS.COM

Download full manual at youfixthis.com

[6] MAINTENANCE CHECK LIST

To maintain long-lasting and safe engine performance, make it a rule to carry out regular inspections by following the table below.

Item		Service Interval										
		Every 50 hours	Every 75 hours	Every 100 hours	Every 150 hours	Every 200 hours	Every 400 hours	Every 500 hours	Every 800 hours	Every 1500 hours	Every one year	Every two years
Checking fuel pipes and clamps		☆										
* Changing engine oil	(1) Oil pan depth (101 mm) (3.98 in.)		☆									
	(2) Oil pan depth (121 mm) (4.76 in.)			☆								
Cleaning air filter element				☆								
Cleaning fuel filter				☆								
Checking fan belt tension and damage				☆								
Checking water pipes and clamps						☆						
* Changing oil filter cartridge	(1) Oil pan depth (101 mm) (3.98 in.)				☆							
	(2) Oil pan depth (121 mm) (4.76 in.)					☆						
Changing fuel filter cartridge							☆					
Cleaning radiator interior								☆				
Changing radiator cleaner and coolant												☆
Changing air filter element											☆	
Checking valve clearance									☆			
** Checking injection nozzle pressure										☆		
Changing water pipes and clamps												☆
Changing fuel pipes and clamps												☆

* Change engine oil and oil cartridge after the first 50 hours of operation.
** Maintenance interval as per EPA instructions.

⚠ CAUTION

- **When changing or inspecting, be sure to level and stop the engine.**

■ NOTE

Lubricating Oil

With the emission control now in effect, the CF-4 and CG-4 lubricating oils have been developed for use of a low-sulfur fuel on-road vehicle engines. When an off-road vehicle engine runs on a high-sulfur fuel, it is advisable to employ the CF, CD or CE lubricating oil with a high total base number. If the CF-4 or CG-4 lubricating oil is used with a high-sulfur fuel, change the lubricating oil at shorter intervals.

- **Lubricating oil recommended when a low-sulfur or high-sulfur fuel is employed.**

Fuel / Lubricating oil class	Low sulfur	High sulfur	Remarks
CF	❍	❍	TBN ≥ 10
CF-4	❍	X	
CG-4	❍	X	

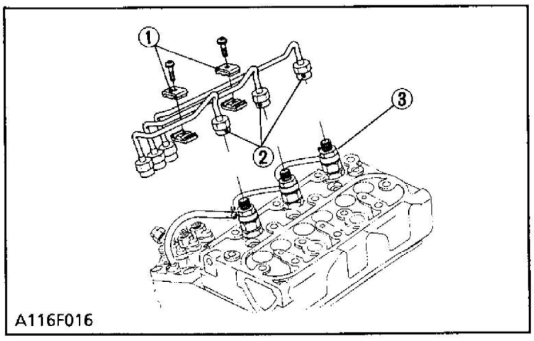
❍ : Recommendable X : Not recommendable

W1035555

KiSC issued 09, 2005 A

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

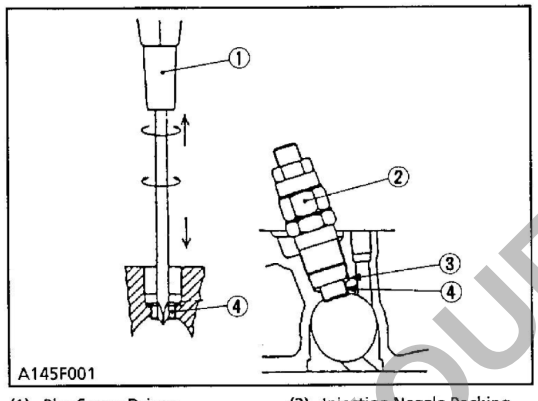


(1) Pipe Clamps
(2) Injection Pipes
(3) Nozzle Holder Assembly

Injection Pipe and Nozzle Holder Assembly

1. Loosen the pipe clamps (1).
2. Remove the injection pipes (2).
3. Remove the fuel overflow pipe.
4. Loosen the lock nuts, and remove the nozzle holder assemblies (3).
5. Remove the copper gaskets on the seats.
6. Remove the nozzle heat seal. (Serial No.: 489291~)

Tightening torque	Injection pipe retaining nuts	24.5 to 34.3 N·m 2.5 to 3.5 kgf·m 18.1 to 25.3 ft-lbs
	Nozzle holder assembly	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs



(1) Plus Screw Driver
(2) Injection Nozzle
(3) Injection Nozzle Packing
(4) Heat Seal

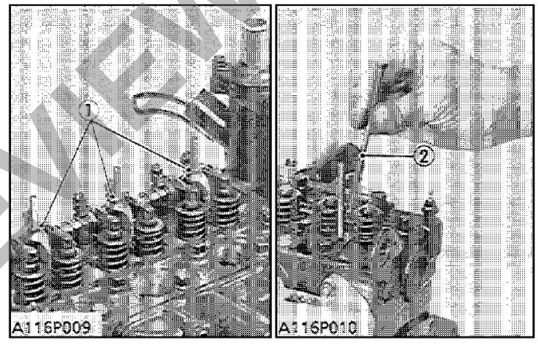
Nozzle Heat Seal Service Removal Procedure (Engine Serial Number : 489291 and beyond)

■ **IMPORTANT**

- **Use a plus (phillips head) screw driver that has a Dia. which is bigger than the heat seal hole. (Approx. 6 mm) 1/4 in.**

1. Drive screw driver lightly into the heat seal hole.
2. Turn screw driver three or four times each way.
3. While turning the screw driver, slowly pull the heat seal out together with the injection nozzle gasket.

   If the heat seal drops, repeat the above procedure. Heat seal and injection nozzle gasket must be changed when the injection nozzle is removed for cleaning or for service.



Rocker Arm and Push Rod

1. Remove the rocker arm bracket mounting nuts (1).
2. Remove the rocker arm as a unit.
3. Remove the push rods (2).

■ **IMPORTANT**

- **After reassembling the rocker arm, be sure to adjust the valve clearance.**

Tightening torque	Rocker arm brakcet nut	9.81 to 11.28 N·m 1.00 to 1.15 kgf·m 7.23 to 8.32 ft-lbs
Valve clearance	Factory spec.	0.145 to 0.185 mm 0.0057 to 0.0073 in.

■ **NOTE**

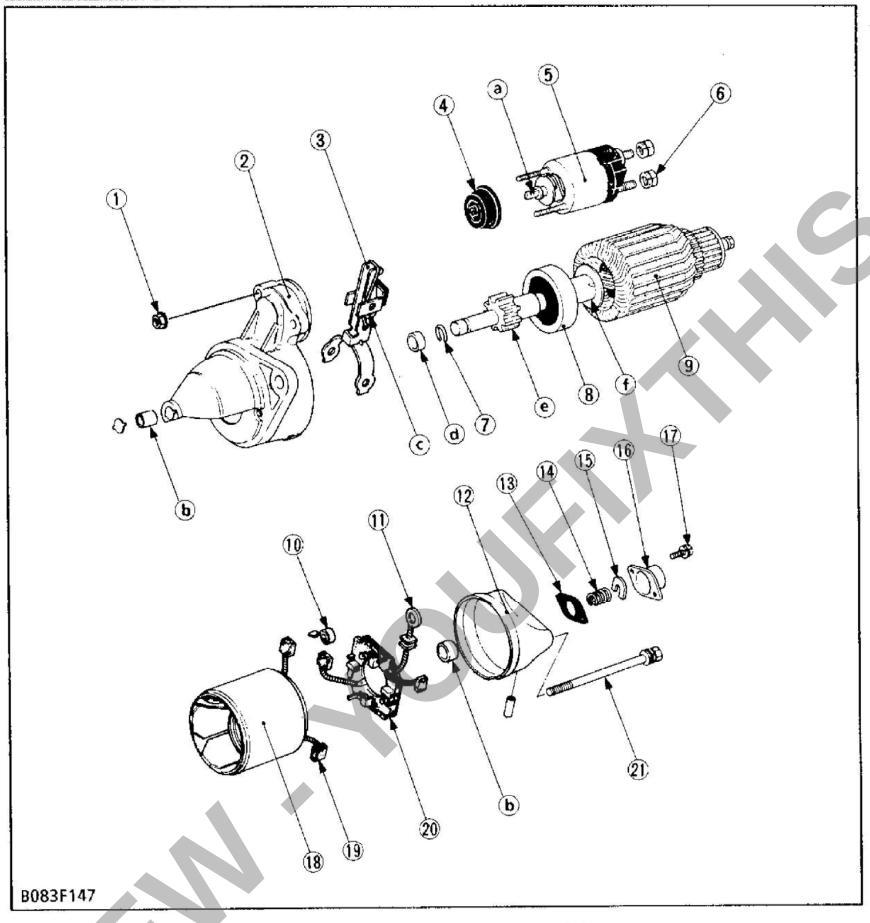
- **When putting the push rods (2) onto the tappets, check to see if their ends are properly engaged with the grooves.**

PREVIEW - YOUFIXTHIS.COM
Download full manual at youfixthis.com

DISASSEMBLING AND ASSEMBLING

[1] STARTER

Disassembling Starter



(1) Solenoid Switch Mounting Nut
(2) Starter Drive Housing
(3) Drive Lever
(4) Gasket
(5) Solenoid Switch
(6) Nut
(7) Snap Ring
(8) Overrunning Clutch
(9) Armature
(10) Brush Spring
(11) Connecting Lead
(12) Rear End Frame
(13) Gasket
(14) Brake Spring
(15) Brake Shoe
(16) End Frame Cap
(17) Screw
(18) Yoke
(19) Brush
(20) Brush Holder
(21) Through Bolt

1. Unscrew the mounting nut (6), and disconnect the connecting lead (11).
2. Unscrew the solenoid switch mounting nuts (1), and remove the solenoid switch (5).
3. Remove the end frame cap (16).
4. Remove the brake shoe (15), brake spring (14) and gasket (13).
5. Unscrew the through bolts (21), and remove the rear end frame (12).
6. Remove the brush from the brush holder while holding the spring up.
7. Remove the brush holder (20).
8. Draw out the yoke (18) from the starter drive housing (2).
9. Draw out the armature (9) with the drive lever (3).

■ **NOTE**

- **Do not damage to the brush and commutator.**

(When reassembling)

- Apply grease (DENSO No.50 or its equivalent) to the parts indicated in the figure.
  - Joint of solenoid switch (a)
  - Bushing (b)
  - Drive lever (c)
  - Collar (d)
  - Teeth of pinion gear (e)
  - Armature shaft (f)

KiSC issued 09, 2005 A

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

[3] TIGHTENING TORQUES

Screws, bolts and nuts must be tightened to the specified torque using a torque wrench, Several screws, bolts and nuts such as those used on the cylinder head must be tightened in proper sequence and at the proper torque.

(1) Tightening torques for special use screws, bolts and nuts

■ **NOTE**

- **In removing and applying the bolts and nuts marked with "*", pneumatic wrench or similar pneumatic tool, if employed, must be used with enough care not to get them seized.**
- **For "*" marked screws, bolts and nuts on the table, apply engine oil to their threads and seats before tightening.**

Item	Size x Pitch	N·m	kgf·m	ft-lbs
* Cylinder head cover cap nut	M6 x 1.0	3.9 to 5.9	0.4 to 0.6	2.9 to 4.3
* Cylinder head screw	M8 x 1.25	37.3 to 42.2	3.8 to 4.3	27.5 to 31.1
* Bearing case screw 1	M6 x 1.0	12.7 to 15.7	1.3 to 1.6	9.4 to 11.6
* Bearing case screw 2	M7 x 1.0	26.5 to 30.4	2.7 to 3.1	19.5 to 22.4
* Flywheel screw	M10 x 1.25	53.9 to 58.8	5.5 to 6.0	39.8 to 43.4
* Connecting rod screw	M7 x 0.75	26.5 to 30.4	2.7 to 3.1	19.5 to 22.4
* Rocker arm bracket nut	M6 x 1.0	9.81 to 11.28	1.00 to 1.15	7.23 to 8.32
* Idle gear shaft screw	M6 x 1.0	9.81 to 11.28	1.00 to 1.15	7.23 to 8.32
Glow plug	M8x 1.0	7.8 to 14.7	0.8 to 1.5	5.8 to 10.8
Nozzle holder assembly	M20 x 1.5	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Oil switch taper screw	PT 1/8	14.7 to 19.6	1.5 to 2.0	10.8 to 14.5
Injection pipe retaining nut	M12 x 1.5	24.5 to 34.3	2.5 to 3.5	18.1 to 25.3
Starter's terminal B mounting nut	M8	8.8 to 11.8	0.9 to 1.2	6.5 to 8.7

(2) Tightening torques for general use screws, bolts and nuts

When the tightening torques are not specified, tighten the screws, bolts and nuts according to the table below.

Grade / Nominal Diameter / Unit	Standard Screw and Bolt 4			Special Screw and Bolt 7		
	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs
M 6	7.9 to 9.3	0.80 to 0.95	5.8 to 6.9	9.8 to 11.3	1.00 to 1.15	7.23 to 8.32
M 8	17.7 to 20.6	1.8 to 2.1	13.0 to 15.2	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
M10	39.2 to 45.1	4.0 to 4.6	28.9 to 33.3	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
M12	62.8 to 72.6	6.4 to 7.4	46.3 to 53.5	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5

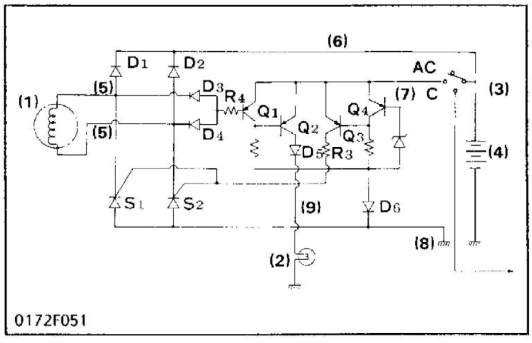
SG00F004

Screw and bolt material grades are shown by numbers punched on the screw and bolt heads. Prior to tightening, be sure to check out the numbers as shown below.

Punched Number	Screw and Bolt Material Grade
None or **4**	Standard Screw and Bolt SS41, S20C
7	Special Screw and Bolt S43C, S48C (Refined)

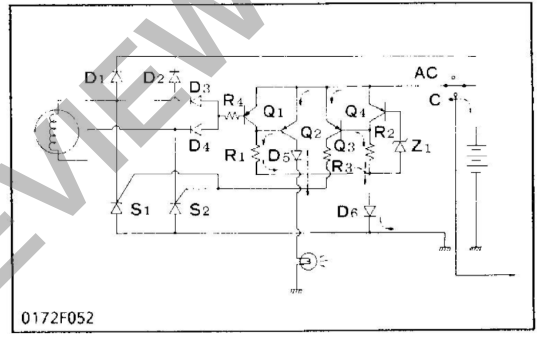
PREVIEW - YOUFIXTHIS.COM
Download full manual at youfixthis.com

(3) Charging Mechanism



The charging mechanism is described in four sections:
1) When key switch is ON
2) At starting
3) In charging
4) Over-charge protection

(1) GEN: Magnet type AC generator
(2) LAMP: Charge indication lamp (not included in the basic engine)
(3) KEY SW: Key switch (not included in the basic engine)
(4) BATT: Battery (not included in the basic engine)
(5) Blue: GEN connecting terminal
(6) Red: BATT + connecting terminal
(7) Yellow: BATT voltage test terminal
(8) Black: BAT – connecting terminal
(9) Green: LAMP connecting terminal
S_1, S_2: Output control/rectification thyristor (SCR)
D_1, D_2: Output rectifying diode
D_3, D_4: GEN generation detecting diode
D_5, D_6: Protection diode for wrong connecting of BATT
Z_1: BATT terminal voltage setting diode
Q_1: GEN generation detecting transistor
Q_2: LAMP on/off transistor
Q_3: Gate current control transistor
Q_4: BATT voltage detecting transistor



1) When Key Switch is "ON"

When the engine is at standstill with key switch set at position 1, the circuit functions to light LAMP, as shown in Fig. 1. With key switch at position 1, current flows to base of Q_2 through the route of BATT ⟶ emitter/base of Q_2 ⟶ R_1 ⟶ D_6 ⟶ BATT and collector of Q_2 is then turned on. As a result, current also flows to LAMP though the route of BATT ⟶ emitter/collector of Q_2 ⟶ D_5 ⟶ LAMP ⟶ BATT lighting LAMP to indicate that charging is not carried out. At this time, though current flows to base of Q_3 through the route of BATT ⟶ emitter/base of Q_3 ⟶ R_2 ⟶ D_6 ⟶ BATT, collector of Q_3 has no current because GEN is stationary.

KiSC issued 09, 2005 A

PREVIEW - YOUFIXTHIS.COM
Download full manual at youfixthis.com

PREVIEW ONLY

You're viewing 8 of 100 pages

The full manual includes:

- All 100 pages, complete
- Searchable PDF (find any keyword)
- No watermarks
- Instant download
- Print-ready quality

GET FULL MANUAL NOW

Kubota Z442-B (E), Z482-B (E), D662-B (E), D722-B (E) Shop Manual

Scan or click anywhere
youfixthis.com

Click anywhere on this page to get the full manual